

REMARKS

Claims 1-5, 7-12 and 14-17 are pending in the present application. Claims 1, 2 and 10 are amended above. Claim 6 is canceled above. No new matter is added by the claim amendments. Entry is respectfully requested.

Applicant notes with appreciation that the Office Action indicates that claims 2, 3, and 11 would be allowable if rewritten in independent form. Applicant wishes to defer submission of these claims, pending consideration of the present amendment.

An Information Disclosure Statement citing references of record in related divisional patent application 10/616,391, filed July 9, 2003, is filed concurrently herewith.

Claim 1 stands rejected under 35 U.S.C. 112, first paragraph. The Office Action states at paragraph 3 that the limitation "the gate mask operating as an etch mask during fabrication of the semiconductor memory device to define the underlying charge storage region and the control gate" lacks support in the specification. Applicant notes that this limitation is supported by the original specification at least at page 14, lines 3-7, and page 15, lines 5-8, with reference to FIGs. 7D-7H. In any event, this rejection is believed to be moot in view of the above amendment to the claim in which the stated limitation has been removed. Removal of the rejection is therefore respectfully requested.

Claims 1 and 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Chang (U.S. Patent No. 6,125,060). Claims 4-9 and 12-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang in view of Yi (U.S. Patent No. 5,455,792).

The present invention of amended claim 1 is directed to a non-volatile semiconductor memory device. The device includes a substrate, a charge storage region on the substrate, and a control gate on the charge storage region. A conductive region is formed in a top portion of the substrate adjacent a sidewall of the charge storage region. A source electrode is provided on the

conductive region, and the source electrode is electrically isolated from the control gate by a source-side insulative spacer. A gate mask is provided on the control gate, wherein the gate mask is in the shape of a spacer. The gate mask has a width that is substantially equal to a width of the underlying charge storage region and a width of the control gate. The source electrode is of a height that is equal to or lower than a top of the gate mask.

The present invention as claimed in amended claim 1 thus includes a “gate mask” in the “shape of a spacer”. As shown and described in the present specification at FIG. 7D (see page 13, line 23 - page 14, line 3), a gate mask 526' is formed by anisotropically etching the gate mask layer 526 (see FIG. 7C). In this manner, the gate mask 526' has the shape of a spacer. The spacer-shaped gate mask 526' is used first to etch the underlying layers 512, 516, 510, 514 (see FIG. 7D) in the source region 550, and later to etch the underlying layers 512, 516, 510, 514 (see FIG. 7H) opposite the source region 530 where the select gate 506 is eventually formed (see FIG. 7I). Thus, the spacer-shaped gate mask 526' is used as a mask during processing to define the underlying “charge storage region”, for example comprised of floating gate dielectric 514, floating gate 510', and interpoly dielectric 516 (see FIG. 6), or comprised of the ONO charge storage layers 820 (see FIG. 9J). The spacer-shaped gate mask is also used during processing to define the underlying “control gate” 512', 812' in a similar manner. In this manner, the “gate mask” 526' “has a width that is substantially equal to a width of the underlying charge storage region” 510' “and a width of the control gate” 512' (see, for example, FIG. 7H).

Chang is cited in the Office Action at page 3, section 5 as disclosing, at FIG. 7d, a “gate mask 122, 125 on the control gate, wherein the gate mask is in a shape of a spacer”. However, with reference to FIG. 7d, the asserted “gate mask” 125 of Chang is not of the same width as the underlying charge storage region 103 and the underlying control gate 101. Therefore, it is submitted that Chang fails to teach or suggest “the gate mask having a width that is substantially equal to a width of the underlying charge storage region and a width of the control gate” as claimed in amended claim 1.

In view of the above, it is submitted that Chang fails to anticipate the present invention as claimed in amended claim 1. Accordingly, reconsideration of the rejection and allowance of claim 1 are respectfully requested. With regard to dependent claims 2-9, it follows that these claims should inherit the allowability of the independent claim from which they depend.

The present invention of amended claim 10 is directed to a non-volatile semiconductor memory device. The device includes a substrate having a source and a drain. A channel is provided between the source and the drain. A charge storage region is provided over the channel. A control gate is provided over the charge storage region. A gate mask is on an entire top surface of the control gate and is in the shape of a spacer. The gate mask has a width that is substantially equal to a width of the underlying charge storage region and a width of the control gate. A select gate is on the channel and between the charge storage region and the drain. The charge storage region, the channel, the drain, the control gate and the select gate form a first unit cell.

As stated above, with reference to FIG. 7d, the asserted "gate mask" 125 of Chang is not of the same width as the underlying charge storage region 103 and the underlying control gate 101. Therefore, it is submitted that Chang fails to teach or suggest "the gate mask having a width that is substantially equal to a width of the underlying charge storage region and a width of the control gate" as claimed in amended claim 10.

In view of the above, it is submitted that Chang fails to anticipate the present invention as claimed in amended claim 10. Accordingly, reconsideration of the rejection and allowance of claim 1 are respectfully requested. With regard to dependent claims 11, 12, and 14-17, it follows that these claims should inherit the allowability of the independent claim from which they depend.

Closing Remarks

It is submitted that all claims are in condition for allowance, and such allowance is respectfully requested. If prosecution of the application can be expedited by a telephone conference, the Examiner is invited to call the undersigned at the number given below.

Respectfully submitted,

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